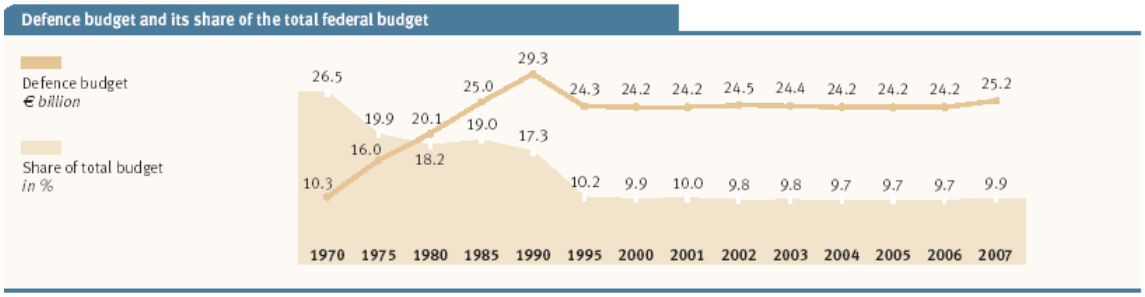
Market Overview:
The NATO armed forces and hence the German, too, are presently in the throes of restructuring. Termed "transformation," the process aims to shape a new capability profile for combating so-called asymmetrical foes such as terrorists and followers of radical ethnic groups, for bringing peace to conflict-torn regions and for related peacekeeping missions. Such forces would be rapidly projected around the globe and be armed with high-grade equipment for joint combat and networked operations in international alliances. Such trends do not necessarily mean that older equipment will be made redundant, but they do open up new and challenging areas of activity for military contractors. During 2003, the German armed forces took the first steps in the direction of such change, mapping out and initiating restructuring action. Starting in 2005, the transformation will very likely show initial impact on procurement plans.

Currently, Germany's defense budget is too small for the ordnance required under today's circumstances. While R&D and technology promotion are largely under-funded by the Defense Ministry, the Ministry is still sticking to its target of raising the share of the defense budget earmarked for modernization expenditures from its current level of 24.5 percent to 30 percent in the mid- to long-term. The ministry has also launched an initiative aimed at maintaining Germany's key defense capabilities. Apart from this, the rollout of the transformation process itself should also spell new R&D opportunities for the UAV industry.

In the period spanning 2004 to 2006, Germany's defense budget amounts to around USD 29.7 billion annually. Based on a GDP/military spending ratio, Germany ranges among the bottom third of NATO members, with 1.1% of GDP going into military spending. Measured against other NATO countries, the funds earmarked for new equipment designed to maintain core competencies on the part of Germany's defense industry were also relatively low.

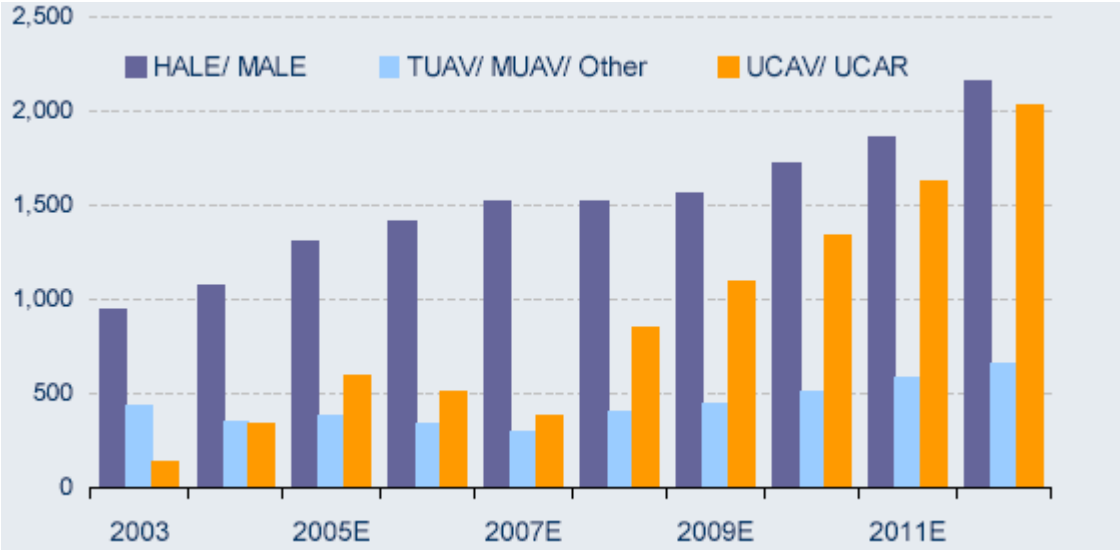
TABLE 1: German Defense Budget



Source: Rheinmetall Defence Electronics

According to Frost & Sullivan, the aggregate military UAV expenditure 2003 – 2012 for the United States and Europe is expected to be USD25 billion. 30% of this expenditure is expected to be directed towards unmanned combat aerial vehicles (UCAVs).

TABLE 2: UAV Expenditure Forecast



Source: Frost & Sullivan, March 2004 – USD billion)

HALE = High Altitude Long Endurance
MALE = Medium Altitude Long Endurance
TUAV = Tactical Unmanned Aerial Vehicle
MUAV = Mini/Micro Unmanned Aerial Vehicle
UCAV = Unmanned Combat Aerial Vehicles
UCAR = Unmanned Combat Armed Rotorcraft

Currently the United States holds the biggest share of the UAV market, but Europe is starting to increase its investments into the development of UAVs.

The German market for UAVs, itself, is in the beginning stages. UAV systems currently employed in Germany are the CL-289 (surveillance and target UAV), LUNA (close-range reconnaissance UAV), and the KZO (surveillance and reconnaissance UAV (Kleinzielflug-Ortungsgeraet – KZO). Most recently, Germany successfully employed UAVs in Kosovo and Afghanistan and has decided to further develop its fleet. This cannot be done without support from U.S. companies already established within the UAV industry.

The Euro Hawk project is a pioneering effort in transatlantic cooperation and exemplifies the need for U.S. expertise within the European UAV market. Due to the advanced state of development of the Global Hawk, EADS chose Northrop Grumman as a cooperation partner in order to develop a European UAV, Euro Hawk. While European industry does not lack the skills required to develop UAVs, it has suffered from insufficient funding, placing it behind U.S. UAV makers.

The European UAV market is expected to be worth around USD6.8 billion, according to the Association for Unmanned Vehicle Systems International – AUVSI, over the next eight years: providing the world's second largest market for UAVs and unmanned combat vehicles over the coming decades. How this market value will be divided between the European allies cannot be determined, as EU projects will involve various countries' participation. The German army is currently involved in various R&D projects involving UAVs and is expected to place significant orders in 2005. Areas of interest are tactical UAVs and lethal UAVs, as well as high-altitude long-endurance (HALE) UAVs and unmanned combat aerial vehicles (UCAVs).

Concrete proposals of the German Federal Ministry of Defense include the purchase of Euro Hawks for USD740 Million. The first prototype delivery is scheduled for mid-2007, with contract approval for series production and initial operational capability expected mid-2008. This schedule will ensure an on-time replacement for the aging fleet of SIGINT-equipped Breguet Atlantiques currently in service.

According to EADS, there is potential for USD3.7 billion worth of UAV projects for the German army over the coming years, if the proposed development and procurement of SIGINT-(tactical signals intelligence), MPA-(Maritime Patrol Aircraft) , and IMINT-(imagery intelligence) versions are followed through with.

Market Trends:
With UAVs expected to better suit future requirements, its global market is poised for rapid growth. Despite the level of UAV performance increasing dramatically, it still continues to be well below mainstream needs, and applications are yet to reach maturity. Since UAV technology still needs improvement, then, UAV manufacturers are constantly trying to integrate and develop several components simultaneously, in order to garner market share.

The European aggregated military UAV budget is expected to reach around USD6.8 billion between 2003 and 2012 (Frost and Sullivan). Application-wise, the market is moving into tactical UAVs (TUAVs) and lethal UAVs (LUAVs), as well as high-altitude long-endurance (HALE) UAVs and unmanned combat aerial vehicles (UCAVs).

What accounts for the growing of interest in UAVs?

- A new level of technology is now widely available, specifically in the areas of higher bandwidth comsat transponders for wide area data links at video data-rated and smaller more powerful computers, allowing increased mission flexibility and more reliable autonomous flight
- A political climate demanding of near zero personnel losses as a condition of committing military forces in contingencies; and
- A recognition that missions that are “dirty, dangerous and dull,” should best be delegated to unmanned vehicles

There are high expectations as to commercial and civil markets for UAVs in Germany. In civil and commercial applications, UAVs are deemed capable of replacing manned aircraft, as well as some ground and satellite applications. In the commercial market, increasing potential client awareness of these novel applications and developing business models that eliminate initial high investments can drive up market revenues.

The commercial market is also application-led, where customers are more interested in cost-effective value additions than the technology itself. Therefore, UAV manufacturers need to focus on comprehensive solutions with short investment cycles.

In civil markets, most UAV deployments are expected to be intelligence, surveillance and reconnaissance (ISR) applications. The challenge for manufacturers would be to introduce downgraded, cheaper military applications. The growing focus on security solutions will be the main revenue driver as the European Union expands and new ISR needs emerge.

The demand for HALE UAVs for maritime surveillance is also expected to grow with Europe's need to monitor its coastline for security and environmental protection. Potential applications for UAVs include wildfire monitoring, illegal fishery monitoring and swifter oil spill discovery.

Import Market:
Although the market may be international in scope and Germany has a history of technological intuitiveness, U.S. companies currently have the leading edge and stand to benefit most, financially, from the developments within this industry. For the immediate future, U.S. companies will be the leading providers of UAVs to the world, controlling more that 50% of the world market and producing more aircraft than any other country.

U.S. companies hold approximately 35-40% of the German import market. In particular, U.S. companies are strong in the areas of sensors and navigation systems. Israel and France are also

strongly represented in the market through companies such as Elbit, Israeli Aircraft Industries (IAI), Sagem SA, and Dassault Aviation.

Competition:
In view of the developing state of the German market and U.S. technology often leading the field, one should not necessarily speak of UAV companies within Germany as competitors but rather should view them as potential partners in a developing market. The three main companies on the German market are EADS, Rheinmetall Defence Electronics GmbH and EMT Ingenieurgesellschaft mbH.

EADS: www.eads.com
The European Aeronautic Defence and Space Co. (EADS), co-headquartered in Germany and France, will be at the heart of the UAV industry through initiatives such as its Euro Hawk joint venture with Northrop Grumman. Euro Hawk would replace Germany's Breguet Atlantic signals intelligence (SIGINT) aircraft starting in 2010.

EADS proposes a maritime surveillance variant of the RQ-4B Euro Hawk as a possible replacement for manned German air force aircraft serving a similar role. The defense giant is also floating a concept for an imagery intelligence (IMINT) version of the RQ-4B for German air force purchase later this decade. It would carry a lightweight version of the European Stand-Off Surveillance and Target Acquisition Radar (SOSTAR).

Another significant milestone in the Euro Hawk program is the founding of a joint venture between Northrop Grumman and EADS. This new company, which would be based in Germany, would be tailored to the customer's requirements and act as the national prime contractor for the German MoD through the entire lifecycle of the system. A related agreement to guarantee necessary technology and information transfer between Germany and the United States is currently being defined by the two governments.

Rheinmetall Defence Electronics GmbH (Bremen): www.rheinmetall-de.com
Rheinmetall Defence Electronics GmbH, which represents the defense electronics division within the Rheinmetall DeTec Group, is a leading producer of defense electronics. At locations in Germany and Greece, the company develops and manufactures products comprising land systems and airborne systems, simulation and training systems, as well as technical publications and logistics engineering.

The Rheinmetall Defence Electronics' product range extends from reconnaissance, fire control systems, and command and control solutions via air defense systems for the army to unmanned aerial vehicles (UAVs), such as reconnaissance and target acquisition UAVs and combat UAVs. The company supplies unmanned air vehicle reconnaissance and target acquisition systems (KZO) to the German Army.

Additionally, Rheinmetall recently formed an alliance with Teledyne Brown Engineering, Inc., Huntsville, Alabama. Teledyne Brown will adapt Rheinmetall's proven UAV system to provide the United States with a UAV system designed for real-time reconnaissance and surveillance as well as armed reconnaissance. Although being designed for the U.S. market, the alliance underlines the importance of establishing joint activities for new market opportunities and combining expertise for the benefit of the customer.

EMT Ingenieurgesellschaft mbH (Penzberg): www.emt-penzberg.de
EMT Ingenieurgesellschaft Dipl.-Ing. Hartmut Euer mbH has been developing products for the German Armed Forces for more than 25 years. EMT's growing family of drones covers the areas of micro drones, mini drones and tactical drones. The aerial reconnaissance and surveillance systems, LUNA, ALADIN and MIKADO, represent the highlights of EMT's range of products. LUNA, the most successful system is used for detection, cognition, identification and location of objects on the ground, for frontier observation as well as for environmental control. Since March 2000, it has been used by the German Federal Armed Forces in the context of the KFOR peace

mission. Since April 2004, LUNA (and ALADIN) supports the German Federal Armed Forces at their mission in Afghanistan (ISAF) within the UN missions.

Other companies in Germany involved in the development and production of UAVs include: Kayser-Threde GmbH (Munich), Diehl Munitionssasteme GmbH (Roethenbach), Bayern-Chemie GmbH (Aschau am Inn), Rolls-Royce Deutschland (Dahlewitz), Bodenseewerk Geraetetechnik GmbH (Ueberlingen), Honeywell Regelsysteme GmbH (Maintal), SFIM Industries Deutschland (Murr), Thielert Motoren GmbH (Hamburg), and MTU Aero Engines (Munich).

Research Institutions:
German Aerospace Center (DLR) – www.dlr.de
The institute of Flight Research within DLR operates engineer-scientific research on a long-term basis within the areas of industrial air and spacecraft developments. A UAV as a system can be divided into four sub-systems: flying platform, sensors, control system, and ground segment (for monitoring purposes). The DLR Institute of Flight Systems is working in all of these areas, with a focus on proving methods for autonomous flight control systems and the development of the required control software. For this purpose, the institute is working with a wide spectrum of aircraft types. Besides model airplanes, which are upgraded for autonomous flight, new types are being developed for special research missions. A second focus is on the design and development of flight control systems for autonomous flight. Besides this, the required sensor equipment of the flying research platforms is another essential task.

UAVs operated by DLR include:

- SOLITAIR – Solar Powered Aircraft for High Altitude Long Endurance Flight
  The solar aircraft demonstrator aircraft is designed for year-around operations in a northern European latitude by satisfying its entire onboard energy needs by its solar panels.
- Prometheus – the transporter
  With a wingspan of 3.2 meters (10.5 feet), Prometheus is one of the larger UAVs of the Institute of Flight Systems and is designed for relatively large, heavy payloads.
- DG 300/17 – High precision flight data acquisition at minimum space allocation and energy consumption
  The DG 300/17 sailplane is used for high-precision flight performance measurements of prototypes and series production sailplanes from almost all manufacturers.
- JULIET – small energy pack
  JULIET (Jetpowered Unmanned Laboratory for Intelligent Experimental Testing) is a turbo-powered model aircraft with thrust vector control for high maneuverability. It is used in the aircraft branch at the Institute of Flight Systems as a platform for the development and testing of flight control systems for very fast and highly maneuverable UAV of this size category.
- MAL (Micro Air Lab) – the flying laboratory
  MAL is the laboratory for autonomous flight. A flight control system enables MAL to perform autonomous missions without pilot remote control inputs.

Additional research institutes in Germany involved in the R&D of UAVs include: Technical University Braunschweig, Technical University Munich, and Technical University Berlin.

End-Users:
The primary end-user in the German market is the German military. Additionally, Germany's involvement in the EU means that the end-users are often found outside of German borders but within the EU. EU-managed defense projects often involve German participation, broadening the focus of the end-users being solely found within the German military.

There are various research projects underway to test the usage of UAVs outside of the defense environment. These are being explored and industry experts hope that the positive resonance from the military will lead the commercial market to invest in UAVs in the near future.

Market Access:

U.S. UAV companies are the market leaders worldwide. Germany's receptivity to American equipment within this market is very high. U.S. manufacturers are ahead of the international market and therefore set the technology standards worldwide by consistently offering the next generation of equipment.

However, this current and increasing use is facing a legal problem. The existing legal framework, as it applies to standard aircraft, is insufficient and unsuited for UAVs. At the international level, few laws govern the production, sale and use of such UAV's. Due to the UAVs' numerous and increasing roles in political crisis situations, and owing to their contribution in combating international terrorism, UAVs can be expected to be integrated into civilian air space, and, accordingly, laws will need to be adjusted to accommodate this aeronautical branch within the civilian sector.

A report, presented by the Technological and Aerospace Committee (Interparliamentary European Security and Defence Assembly - WEU), stated that it was up to the new European Defence Agency (EDA) to "develop a common, interoperable and interchangeable European standard, which could provide a reference for interaction between European and American systems."

Otherwise, the WEU assembly warned, U.S. and European military forces will be unable in the medium-term to conduct joint operations in low- to medium-intensity conflicts unless the United States and Europe cooperate on all types of unmanned aerial vehicle projects. Guidelines are being worked on, with the earliest expected in 2005.

Germany's regulations and bureaucratic procedures can be a difficult hurdle for companies wishing to enter the market, and U.S. companies should check carefully with appropriate offices as to which testing procedures are required for their products or services in order to be competitive in the German market. Companies wishing to receive a list of organizations that provide information on EU or German standards should contact the U.S. Commercial Service in Germany (contact details at end of report.)

Market Entry:
For U.S. suppliers attempting to enter this market, it is crucial to: (a) adjust U.S. products to meet European technical specifications, (b) be prepared to make concessions to European design expectations, (c) adapt U.S. products to European quality standards, and (d) rigidly adhere to negotiated terms of delivery. It is extremely important that American manufacturers and suppliers assist with end-user applications engineering and subsequent servicing, and offer training courses for programming, operation, and maintenance.

- Who is awarding military contracts?
Central procurement:
Within the central procurement process, requirements of the Army, Air Force, and Navy are jointly identified. The following items are centrally procured: studies, R&D projects, defense items, and supplies (motor vehicles, Air Force, and Navy equipment, telecommunications equipment, arms and munitions, projectiles etc.).

E-Procurement:
Within an initiative called "Bund Online 2005", which is to promote e-government, the Bundeswehr (German Army) covered new ground with the installation of a procurement platform in the Internet. Since March 14, 2003, companies have been able to find information and enter the bidding process under www.evergabe-online.de.

- How to enter into business:
To ensure a broad range of competition, the procurement agencies are not allowed to use data banks on known companies as the sole basis for an award of a contract. U.S. companies wishing to enter into the defense business with the German armed forces may wish to contact the U.S. Commercial Service in Germany (see end of report).

Opportunities for Profile Building:
Participation at international defense technology fairs as well as individual, customer- and demand-oriented events at home and abroad is a platform for supporting existing markets and opening up new ones. Direct contact with customers, decision-makers and army officers at all levels is therefore an important success factor for companies wanting to access the German UAV market.

Upcoming Trade Shows/Events:
Paris Air Show, June 13-19, 2005; Paris, France - www.paris-air-show.com
The Paris Air Show is the leading international event for the aviation, aeronautics and space industries. For its last edition, in 2003, the show featured 1,728 exhibitors, representing 41 countries, displaying their products and services for over 94,000 trade visitors from 141 countries. Exclusive space is dedicated to the UAV's, as well as a diversity of conferences.

ILA – The Berlin Airshow, May 15-21, 2006; Berlin, Germany - www.ila-berlin.com
ILA is the third largest European air and space trade show. The 2004 event showcased 987 exhibitors from 43 countries, presenting the entire range of products and services, featuring current and future developments in aerospace technology. 201,500 attendees (105,200 trade visitors), including 120 government representatives, from 22 European countries attended the 2003 event.

Eurosatory, June 12-16, 2006; Paris-Nord Villepinte, France - www.eurosatory.com
Eurosatory is a leading trade fair for land and land-air defense. The 2004 show featured 977 exhibitors from 44 companies and was attended by 44,700 trade visitors.

Key Contacts:
There are a multitude of government and trade/professional associations for the aerospace industry in Germany.
German Aerospace Center (DLR) – www.dlr.de
Ministry of Defense (procurement) – www.bwb.org
German Society for Aeronautics and Astronautics (DGLR) – www.dglr.de
German Aerospace Industries Association (BDLI) – www.bdli.de

For further contacts, please contact the US Commercial Service in Germany:

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